

(4) Review software for spatial analysis.



Geospatial Statistics and Issues in Energy Modeling

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R : Copyright 2000.
Version 1.0.0 Patche

R is free software
You are welcome to r
Type "?license" c

R is a collaborative
Type "?contribut

Type "demo()" for
"help.start(
Type "q()" to qui

[Previously saved workspace restored]

```
> library(GRASS)
> G<-gmeta()
> landsat <- rast.get(G, rlist=c("tm1990.1", "tm1990.2", "tm1990.3", "tm1990.4"))
> names(landsat) <- c("b1", "b2", "b3", "b4")
> boxplot(data.frame(landsat), main="LANDSAT", las=2)
> library(xgobi)
> xgobi(landsat)
xgobi -title 'landsat' -std max /tmp/xgobi-land
reallocating: n > 20000
size of data: 36000 x 5
>
```

Raster to Polyline

Input raster: Output.col.polsh

Field (optional): VALUE

Output polyline features: C:\Spatial\Results\Site.mdb\new_south

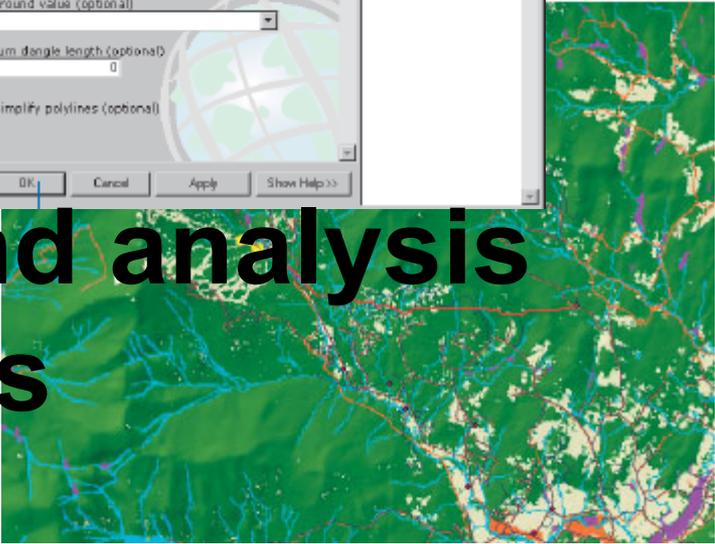
Background value (optional): ZF0

Minimum angle length (optional): 0

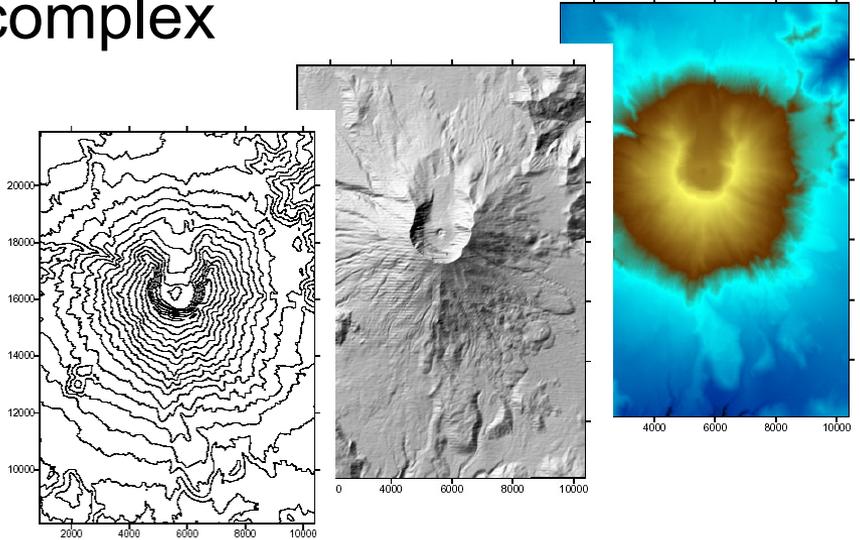
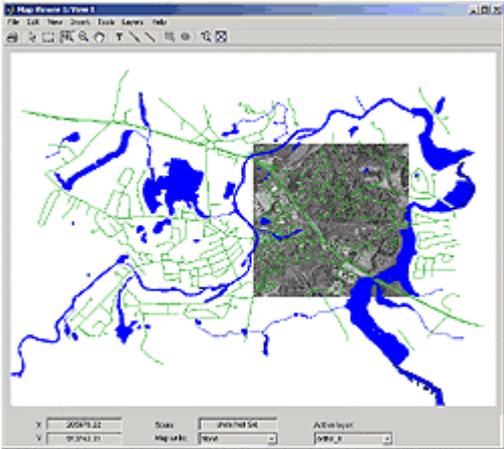
Simplify polylines (optional)

Buttons: OK, Cancel, Apply, Show Help >>

Spatial viewing and analysis packages



Simple to complex



Spatial viewing software



- The common term used is Geographic Information Systems, or GIS
- GIS is a methodology to view, integrate, and tie together spatial data
- Tool sets that should be available to any user of spatial viewing data are:
 - Basic exploratory analysis of spatial data
 - Merging spatial datasets
 - Basic regression and spatial statistics

Commercial Software



- On The GIS site:
 - The most famous GIS – ESRI’s “Arc” series of tools
 - The affordable yet still powerful GIS – Golden Software’s *Surfer*, *Map Viewer*, and *Didger*
 - There are others
 - *GeoMedia*, *MapInfo* – and numerous competing platforms
 - Information can be found at:
http://www.gogeo.ac.uk/cgi-bin/geoPortal9/Res_SoftwareComm.pl
- The most scientific/engineering tool – MATLAB
- The most statistical – S-Plus (based on the S language)

Open-Source (Free) Software



- On the GIS site:
 - GRASS (Geographic Resources Analysis Support System)
 - PostGIS
 - The above follow the Open GIS Consortium (OGC) specifications
<http://www.opengeospatial.org/>
 - There are many other systems of various levels. Information can be found at: *<http://opensourcegis.org/>*
- On the statistical site:
 - R, an open source implementation of the S language



- ESRI has a wide suite of tools for multiple applications. The basic suites are
 - Desktop GIS Overview
 - ArcReader (free)
 - ArcView (GSA \$2857)
 - ArcInfo (GSA \$7295)
 - ArcGIS Desktop Extensions
 - Spatial Analyst
 - 3D Analyst
 - Network Analyst
 - All cost at least GSA \$2040
 - To handle large databases — SDE — the Spatial Database Engine – GSA \$8160

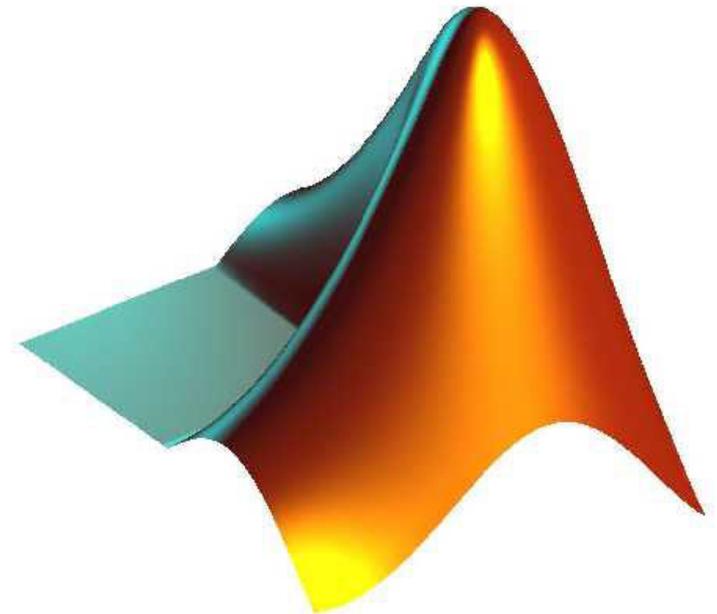


GIS by ESRI®

MATLAB



- MATLAB has long been a leader in scientific software – probably the most powerful and versatile assessment software available
- Requires the main MATLAB software (\$2090 – no GSA discount)
- Required for doing spatial analysis - Mapping Toolbox - \$900
- Other toolboxes (statistical) may be required - \$800/per
- Concurrent license is approximately 4x the above



S-Plus/R

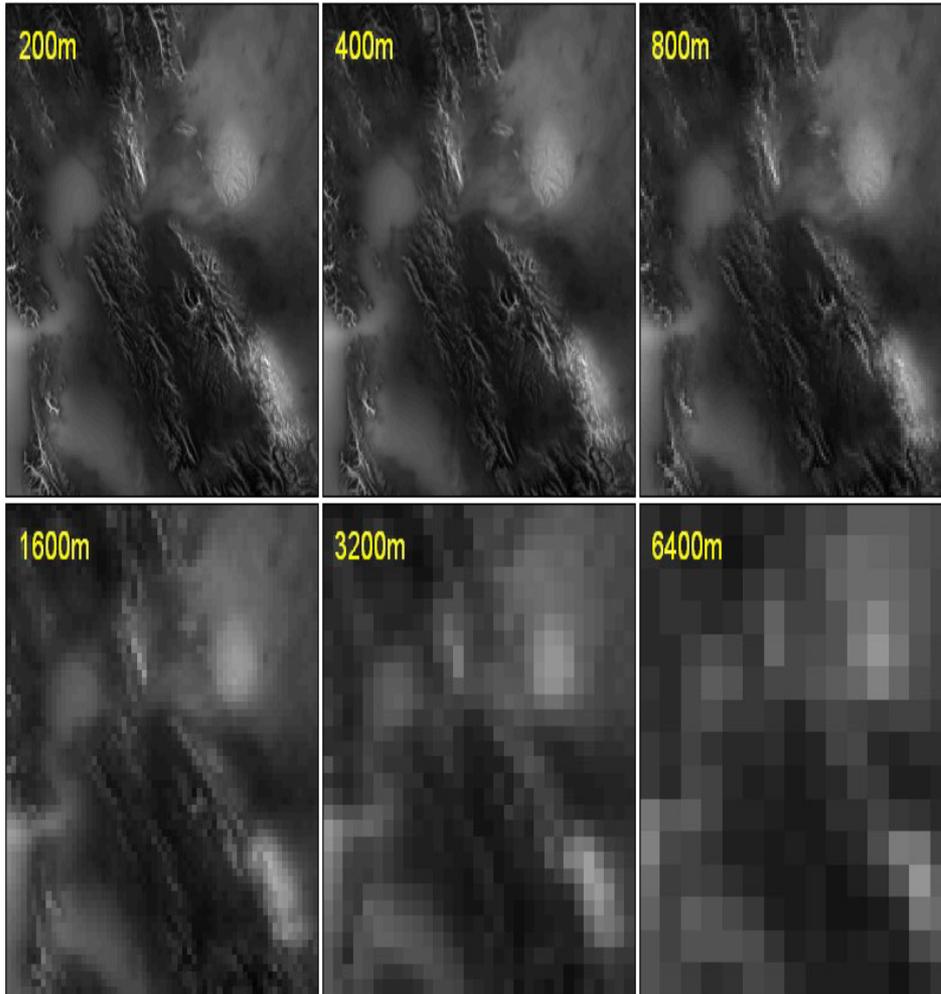


- Both are implementation of the same programming dialect; the S language.
- S-Plus is a well established enterprise statistical learning tool:
 - Well supported and well documented.
 - Better at treading large datasets than R.
 - Has extension (module) for spatial analysis.
- R is a more rapidly (open-source) evolving environment with a firm foundation within the academia and the research community:
 - Has a very active user base.
 - Represents the state-of-art in statistical computing
 - Has a number of spatial-oriented extensions

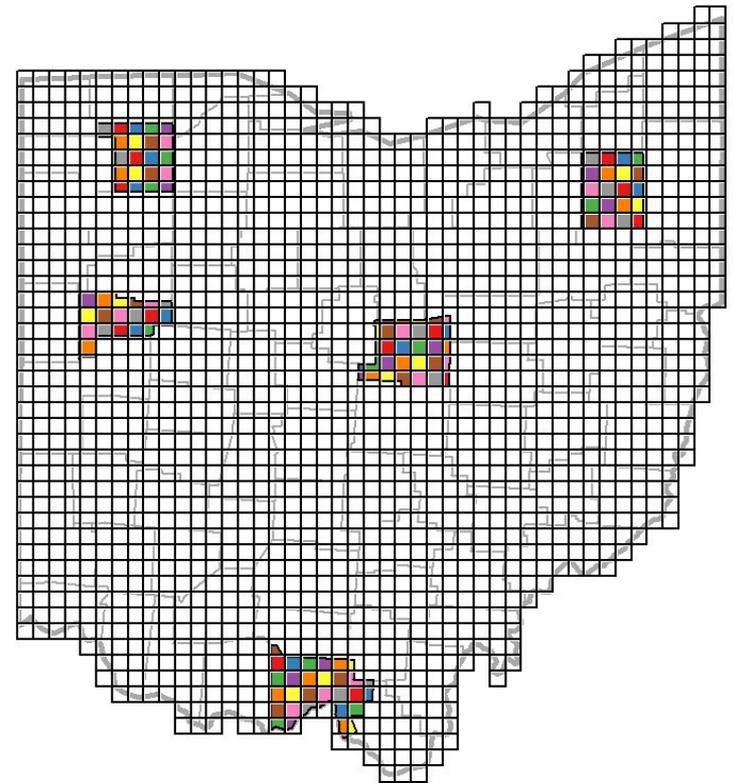
R-Stats package



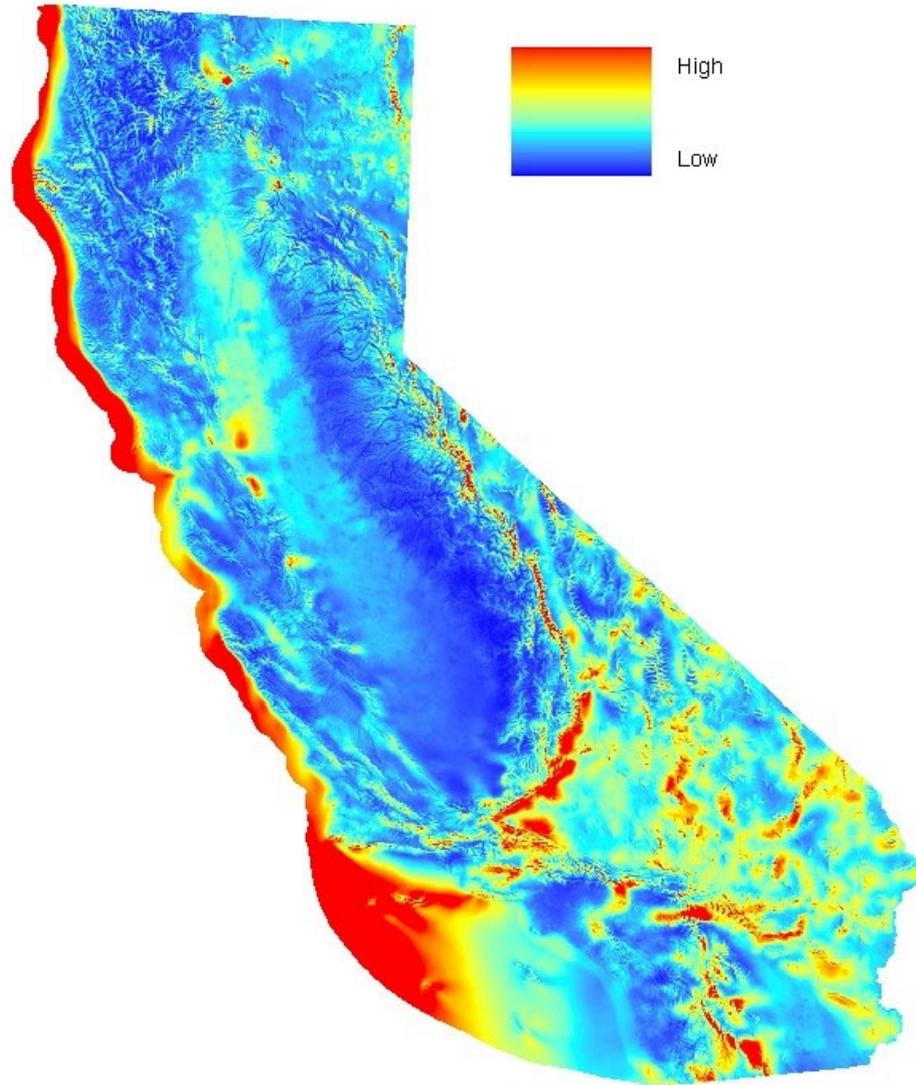
Raster Data



Vector Graphics



ESRI's ARC GIS Display

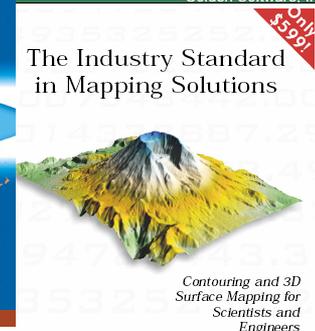
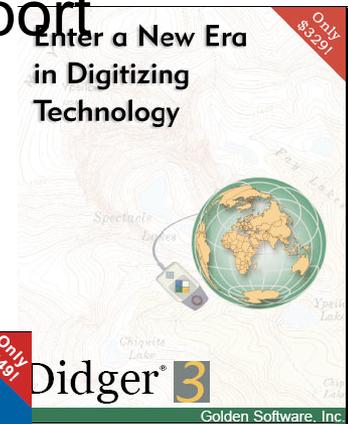
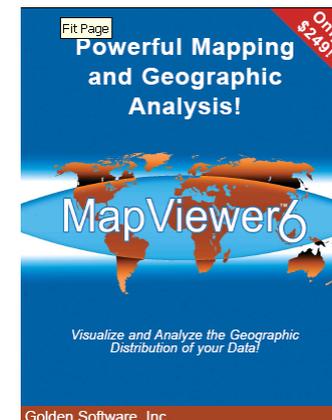




Golden Software Suite



- Surfer (\$599), MapViewer (\$249), and Didger (\$329)
- Inexpensive, easy to use – but limited database access
- Surfer has extensive geostatistical tools
- MapViewer has GIS capabilities and ability to import Microsoft Access Database
- Didger allows easy import and transformation of raster files
- All can import ESRI Shape files



Other commercial technologies



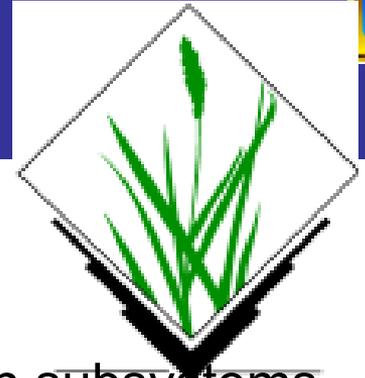
- Oracle Spatial
- GeoMedia
- MapInfo
- Advantages of commercial software
 - All are well supported and have been around (and will be around) for a long time
- Disadvantages
 - All are costly – on the same order of cost as ArcINFO (except Surfer et al)
 - Surfer and MapViewer have no ODBC capability

GRASS



- Geographic Resources Analysis Support System – developed by the Army Corps of Engineers to help manage their extensive spatial databases
- It is part of the Free Software/Open Source released under GNU General Public License (GPL)
- Originally limited to raster, it now has powerful abilities to implement 2-d and 3-d vector analysis
- <http://grass.ibiblio.org/index.php>

GRASS



- GRASS is a raster/vector GIS combined with integrated image processing and data visualization subsystems
- Includes a large number of modules for management, processing, analysis and visualization of georeferenced data
- Has been integrated with R and the associated GSTAT (Geospatial Statistics) and GRASP (Generalized Regression Analysis and Spatial Prediction) packages
- Source code is available to easily write packages to integrate with multiple other software applications